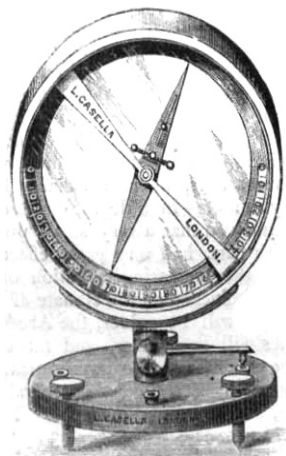


adjustable in a direction to the right or to the left. The metallic circle within which the needle revolves is graduated on both faces, and is inclosed within an air-right case. The instrument turns upon a vertical support above a solid metal plate standing on three levelling-screws. A small loose level, which can be placed upon this levelling-plate, accompanies the instrument. The main novelty in Mr. Goolden's instrument, consists, however, in the arrangements by which the angle of dip may be determined without having either a horizontal graduation or a horizontal compass needle upon the apparatus. It will be seen by reference to the figure that the vertical axis of the instrument is furnished with a spring-arm, which can be clamped to it by turning a screw, and that there are four metal studs affixed to the stand at equal distances apart, into any one of which the pin at the end of the spring arm can be pressed down. These arrangements serve to facilitate the following adjustments. Having levelled the instrument the spring-arm must be unclamped and the pin at the end of it pressed down into the conical hole in one of the studs. While this is so held with one hand the vertical circle is turned upon its axis with the other hand *until the needle points directly*



Goolden's simple dip-circle.

vertically downwards to 90°. In this position, which is of course exactly magnetically East-and-West, the vertical circle is clamped by a turn of the screw. The position is verified by turning the whole circle and spring arm together upon the axis until the pin meets the opposite stud, when the needle will again point vertically downwards. The East-and-West position being thus verified, it is clear that the magnetic meridian will lie in a plane at right angles to this. Hence the next process is to turn the circle round and press the pin into one of the two studs which lie at right angles to the pair already employed. The position of the needle in the circle is then read off. The circle is once more turned through a complete semicircle, the pin pressed into the opposite stud, and another reading is taken: the mean of these two being accepted as the true angle of dip. It will be seen that the usual elaborate processes of eliminating possible errors by reversing the needle-axis upon its bearings and reversing the magnetism of the needle itself are not attempted. Everything will therefore depend upon the accuracy of the adjustments of the instrument before it leaves the maker's hands. As it is, it is claimed that the readings are correct to within 10 minutes of arc.

THE COMET

MR. CHANDLER has made another approximation to the orbit of this comet, and now finds the following ellipse (*Science Observer*):—

Perihelion Passage September 17²³04 Greenwich M. T.

Longitude of perihelion	276° 28' 26.8"	} M. Eq. 1882.0.
" ascending node	345° 50' 34.0"	
Inclination	38° 5' 3.8"	
Log. perihelion distance	7.8835636	
Eccentricity	0.9999700	

Retrograde.

The period of revolution corresponding to this ellipse is about 4070 years; in the middle of November there was a decided difference between the calculated and observed positions, part of which may be due to a cause to which Mr. Chandler has already drawn attention, viz. that the same point in the head of the comet may not have been always observed. We may now say pretty confidently that a short period of revolution is inconsistent with the motion of this comet, and consequently that it is not identical either with the great comet of 1880 or with that of 1843. Nevertheless we must repeat that there are indications of sensible perturbation during the flight through the coronal regions of the sun.

Mr. Gill sends us some particulars relating to the early Cape observations of this comet. It was first detected by Mr. Finlay at five o'clock on the morning of September 8, as he was returning to his house from the observatory. He went back and compared the nucleus with a small star in its immediate neighbourhood. On the following morning the comet was observed again, and the same day Mr. Gill sent the following telegram to Sir James Anderson, Chairman of the Eastern Telegraph Company:—"Kindly tell Astronomer Royal, Greenwich, that bright comet was observed here yesterday morning by Finlay. Right Ascension this morning nine hours forty minutes, increasing daily nine minutes, Declination one degree south, increasing half degree south daily." Mr. Gill acknowledges his indebtedness to the courtesy and liberality of Sir James Anderson for the free transmission of many previous messages. Unfortunately this one notifying the discovery of the comet in some way miscarried, and did not reach Mr. Christie's hands, so that the first intimation of the visibility of the comet came from Mr. Cruls at Rio de Janeiro, who, however, so far from being a discoverer, has informed the Academy of Sciences of Paris, through M. Faye, that he received notice of the comet's presence from another quarter on September 10; it was not seen at the observatory of Rio till 5h. 15m. a.m. on September 12.

Cloudy weather prevailed at the Cape between September 10 and 17, and very few observations could be procured, and those had to be made by measuring the difference of altitude and azimuth from bright stars. On Sunday, September 17, the comet was easily visible with the telescope in full sunshine, and in close proximity to the sun. It was followed during the day by Mr. Finlay and Dr. Elkin, and towards afternoon was found to be rapidly approaching the sun. As the distance diminished "all appearance of tail was obliterated, only a round disc about 4" in diameter remained visible, but this was intrinsically as brilliant as the surface of the sun, if not more so. Still closer this disc approached to the sun's edge, and its disappearance there was observed just like that of a star when it was occulted by the bright limb of the moon." Both Mr. Finlay and Dr. Elkin observed the disappearance, but though the former was using much the more powerful telescope, he only saw the nucleus five seconds longer than Dr. Elkin; the comet had passed on to the sun's disc (not behind it, as Major Herschel erroneously assumes in NATURE last week), but no appearance whatever of its presence there could be perceived. Mr. Gill himself was not able to arrive at this unique observation, having proceeded to Simon's Bay to meet Capt. Morris, R.E., on his way in the *Liguria* to Brisbane to observe the transit of Venus, who returns to South Africa as chief Executive Officer of the Geodetic Survey of the Cape Colony and Natal; but

on the morning of the following day he observed the comet rise just before the sun at Simon's Bay, and says he will never forget the beauty of the scene. Many drawings of the comet were made at the Cape Observatory, and some photographic pictures were obtained with the assistance of Mr. Allis, of Mowbray. To obtain a perfect picture of the more delicate details of the comet, an exposure of not less than half an hour was found to be necessary.

The following places are abbreviated from an ephemeris calculated by Mr. Chandler from his last elliptical elements:—

At Greenwich mean noon.

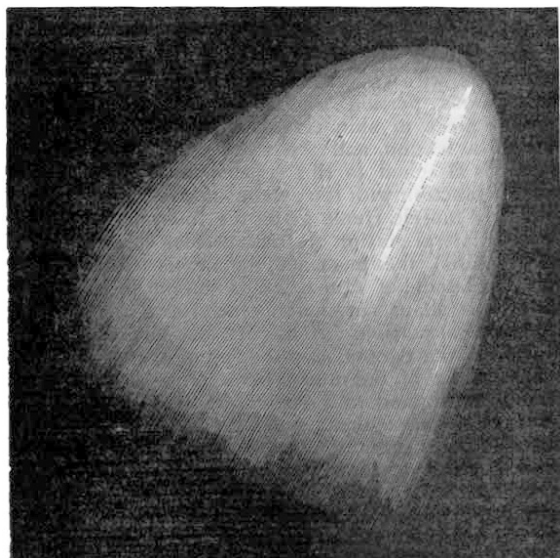
	Right Ascension.	Declination.	Log. distance from
	h. m. s.	° ' "	Earth. Sun.
December 7	... 8 31 41 ...	... -29 42' 7 ...	0'1868 ... 0'3110
9	... 8 25 28 ...	... 29 57' 6 ...	
11	... 8 19 10 ...	... 30 9' 8 ...	0'1917 ... 0'3250
13	... 8 12 48 ...	... 30 19' 1 ...	
15	... 8 6 24 ...	... 30 25' 5 ...	0'1978 ... 0'3384
17	... 7 59 58 ...	... 30 28' 9 ...	
19	... 7 53 33 ...	... 30 29' 3 ...	0'2051 ... 0'3512
21	... 7 47 9 ...	... 30 26' 8 ...	
23	... 7 40 49 ...	... -30 21' 4 ...	0'2137 ... 0'3635

Up to Nov. 6 the comet discovered by Mr. Barnard had been sought for unsuccessfully at the Cape Observatory.

We have received the following communications on the comet:—

WITH the permission of Vice Admiral Stephen C. Rowan, U.S.N., Superintendent of the Observatory, I send you a sketch made at 17h. Washington Mean Time, November 15, with the 26-inch Washington equatorial. At the time of observation the head of the comet was about 45 minutes east of the meridian.

As it is extremely difficult to represent such an object faithfully in a woodcut, I will call attention to the fol-



Comet δ , 1882, November 15'7, U.S. Naval Observatory, Washington.

lowing points:—The nucleus presents a very woolly, nebulous appearance, with a main point of condensation, almost circular; near its following end, and about 18" from this towards the tail, a second point of condensation, prolonged about 54" in the direction of the tail in a narrow ridge of light. This ridge which has heretofore appeared broken up into four or five beads, is now a continuous line of light with, perhaps, in one or two places, faint indications of condensation. The nucleus is decidedly eccentric with regard to the general direction of the head, and the head is flattened on the *north-following* side.

The position-angle of the major axis of the nucleus was 309°.4. The distance between the centre of the two main points of condensation, from a series of measures with the filar micrometer was 18". A magnifying power of about 200 diameters was used. On November 17'7 the extreme length of the nucleus was found by Commander Sampson to be 74".

The following meridian observation for position was obtained on November 15'7 with the transit circle;—

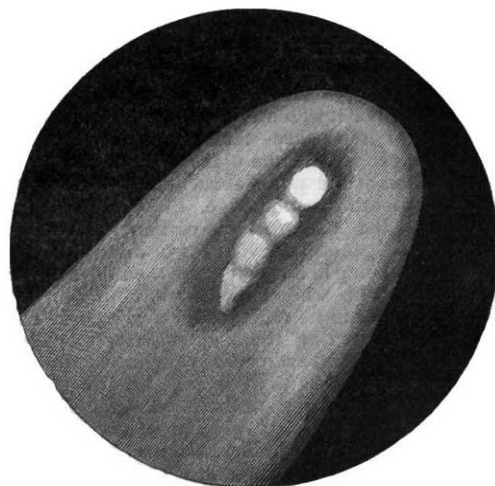
1882 November 15'74 (Washington M.T.)

R.A. 9h. 27m. 50s. 72
N.P.D. 114° 49' 18" 9

The part observed was the main point of condensation near the following end of the nucleus. The observation is corrected for refraction, but not for parallax.

WILLIAM CRAWFORD WINLOCK,
Assistant Astronomer, U.S. Naval Observatory

THE drawing represents the appearance of the great comet at 5 a.m. on the morning of October 12 this year. I delayed the publication of my observations on this morning in the hope of securing some more views, but the bad weather prevented any further observations of this object here. The drawing shows distinctly four condensations in the nucleus, whose angle of position on the 12th was about 102°. Its length was 40" 3, as measured with the filar micrometer on the great refractor. The visible length of the tail was estimated at 21°. No doubt



The Great Comet seen in the Markree Refractor, October 12, 1882, 5 a.m..
by W. Doberck.

it was really much greater. Its southern side was well defined. As seen with the naked eye the nucleus shone as brightly as a star of between the first and the second magnitude. On the morning of the 6th I had seen the end of the tail, which was then apparently 15° long, present a feature very like that indicated in Major Herschel's drawing (NATURE, vol. xxvi. p. 622), but I am not sure of this, as the sky was partly covered with cirro-cumulus clouds.

On October 28, at 5h. 45m. a.m., the angle of position of the nucleus was about 113°, and its length amounted then to 67". The tail was less curved than on the 12th.

Markree Observatory, December 2 W. DOBERCK

FUNCTION OF THE MEMBRANA FLACCIDA OF THE TYMPANIC MEMBRANE

WHY should a smart blow, as, for instance, with the palm of the hand on the side of the head, or on the wing of the ear, cause rupture of the membrana tympani?